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April 2, 1971

Attention: John C.

Dear John:

Enclosed please find three copies of Activity Summary
No. 33, 2201201-AS-33.

Sincerely yours,



Senior Scientist

RD/c
Enclosure

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~~25X1~~No. of Pages 2

March 31, 1971

To: John C.

From: [REDACTED]

Subject: Activity Summary
Facility Visit, Contract [REDACTED]

Reference: [REDACTED] 2201201-AS-33

Dates: March 23-24, 1971

On March 23-24, [REDACTED] visited the sponsor facility for the purposes of manipulating operational imagery and to review the transfer function measurements made on the system using both sinusoidal and edge targets.

Approximately twelve transparencies, chosen by John C. and [REDACTED] were processed in the system. Although all these transparencies were substantially improved in contrast and high frequency information only six of the results having details of interest were printed. From these prints a particularly promising example was selected and the corresponding transparency again processed in the system. This experiment consisted of a through focus test to ensure that all the information rendered observable by the processing was recorded in the picture since the first print did not contain all the information visually observable. Results of this experiment, recorded both on Pan X and Polaroid film, will be analyzed on the next visit.

Transfer function measurements obtained from sinusoid targets appear quite reasonable. John C. has used these results to predict three bar response with good success. A determination

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of the transfer function from an edge trace is currently in progress. A comparison was made of transfer function measurement made on the customers equipment with that made on the equipment. These transfer functions will be analyzed in subsequent visits.

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ACTIVITY SUMMARY

To: John C

From: [REDACTED]

Subject: Activity Summary
Facility Visit, Contract [REDACTED]

Reference: [REDACTED] 2201201-AS-33

Dates: 17, 18 March 1971

On 17, 18 March, [REDACTED] visited the customer facility on Contract [REDACTED]. This visit was primarily for putting together an organization of the required work for the next six months. There are presently three areas of activity that are being pursued and emphasis must be maintained on each. Further, laboratory requirements are increasing because of both coherent and partially coherent operations that are being pursued simultaneously. The basic writing for the organization is enclosed with this summary, although copies were left with John C. on 18 March. The write-up will be discussed, and continued to provide a carefully defined plan and time-work charts with specified laboratory facility requirements.

The next program visit is scheduled for 23, 24 March by [REDACTED] on the subject of operational examples.

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~~SECRET~~Program Plan

To: John C.

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From: Subject: Program Plan for week
of 22 March, 1971.

Date:- 18 March, 1971

The primary purpose of this two day visit was to initiate more detailed organization plans for the laboratory program. There are several areas of activity that must be maintained or built-up, and it is time to review the schedule of Jan. 14 and provide a new approach based on recent developments. In review, there are three areas of activity at present. Their status is reviewed here and immediate objectives are outlined. A six month organization is in the making.

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1. Optical Image Manipulation by contrast and high frequency enhancement

The OIM area with amplitude filtering for high frequency enhancement is being concluded, and our 14 Jan. schedule is directed to conclude this activity by April 30. This remains a good time sequence. Most of the remaining work is being performed by John C. in implementing the edge trace analysis and concluding the data reduction. [] is contributing in these areas to aid the progress of the program and present the data in best format. [] contribution^{25X1} at the lab facility is about 1 day/wk. for this activity.

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2. Application of amplitude OIM to operational imagery.

This task is an on-going program at relatively low level. The task is directed to define the effectiveness of OIM for operational material, and is demonstrated with comparisons of processed vs. unprocessed imagery. This work is discussed in detail in working notes attached to this document, generated for planning^{25X1} purposes. At a steady rate, plans to input two to three man-days per month to perform OIM activity on operational material, supplemented by additional time for selection and searching samples of interest.

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3. Coherent OIM activity

This is the task that is being built-up in activity and will receive most emphasis as the weeks proceed. It will be the primary task after April 30, when the amplitude OIM activity is continued at a level as described above. This program will contain the following approaches.

- (1) Build up methodology and expertise in the fabrication of the phase components of filters.
- (2) Design filters for the coherent OIM applications
- (3) Lay out methods for implementation of filter fabrication methods and perform same.
- (4) Generate laboratory test targets and later on, select operational

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- test targets (engineering tests).
- (5) Set up optical system for coherent OIM. First test out feasibility for using a partially coherent diffuse spot to perform "coherent" OIM with complex filters. Spot must be small with respect to scale of filter, but it may reduce coherent noise. Also use conventional pinhole source and compare.
- (6) Construct similar filters for holographic systems and compare in-line with holographic processed results and capabilities.

This will be continued as the year progresses but the above should

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entail about six months. Continued activity will extend into testing several hybrid approaches to OIM for generation of filter functions of greater complexity. Hybrid techniques are required for the generalized approach to OIM.

Immediate approach for the week of 22 March should include ~~the~~ direction under item 2, ① to review all that was performed on our previous three day session and apply our gains in a usable manner for presentation, ② to search out new samples of imagery and new sources of imagery of interest, ③ to perform OIM on dupe positives from previous search sessions and ④ to discuss coherent system

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applications for initiation of filter fabrication methodology and system set-up for processing. (5) Also time should be applied to conclude the scheduling initiated this week.

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Recommendation is for [] to perform activity (1) to (4) during a two day visit to the lab, and for [] to contribute to these items and item (5) with John C.

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Working Notes

To John C.

From

[Redacted]

Subject :- Discussion of areas of application for scheduling purposes.

Date :- 17 March, 1971

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Subj.: High Frequency OIM

Objective: - To ~~isolate~~ ~~the~~ the effectiveness, on a laboratory system, of high frequency enhancement, to improve information extraction capabilities on operational material.

Method: - To find operational examples and apply OIM system to illustrate gain in information extractability. We need to illustrate the gain by imagery, comparing photos before and after processing through the OIM system. The imagery must show that the OIM system has provided obvious gain in image content - either by effectively decreasing threshold so that imagery can be detected that previously was undetected, or by altering the structure (e.g. by edge sharpness) so that the object becomes

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Working Notes

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more discernable. We should therefore select imagery for input that is of very low contrast, such as by cloud cover or by exposure (etc:-). It is ^{with} lower contrast type imagery, or low contrast components of higher contrast imagery, that enhancement gains can be best illustrated.

Level of Effort:- The term of this operation should continue at least through the calendar year 1971, on a low level. The time is required to take advantage of imagery of importance to the community - and imagery that comes available, because these examples can be most pertinent to illustrate potential gain. We have started this form of approach, with

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Working Notes

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intermittent searches for new imagery and ~~with~~ optical manipulation sessions.

It is recommended that about 15-20% of the level of effort be applied to this task. For example, ^{25X1}

I recommend that apply 2 days / month at the facility for this purpose, supported by some supporting activity, 1 day / month of to aid in ^{25X1}

obtaining examples. This time would be proportional to an equivalent contribution by customer personnel (approximately 4 man days per month).

This effort will be reviewed and rescheduled if necessary by June 30.

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Subjects- Coherent Optical Image Manipulation

Objective:- To implement and apply to laboratory prepared and operational imagery, coherent optical image processing techniques. A parallel objective is to demonstrate and evaluate relevance of these techniques to the customer objectives.

Method:- To set the operation up, both in-line and holographic, to implement all phases at the customer laboratory including the filter fabrication techniques, and to compare results of processed imagery with input imagery. By performance of the outlined task we should be able to determine the relevance of the coherent techniques to customer objectives. (A

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thorough outline of the coherent methods is provided elsewhere.) When the operational application is to be considered we should first apply the process to engineering test imagery such as through focus and image motion compensation tests. One of the examples could demonstrate how the resolution curve of a through focus test is flattened out by proper compensation. The same is true of image motion compensation test imagery.

Level of Effort: — The coherent processing effort should be the major emphasis of the laboratory program. At this time we are completing the OIM amplitude process, maintaining at low level the operational example of OIM,

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Working Notes

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and initiating the coherent processing techniques, starting with filter fabrication ~~methods~~. Therefore we should be building up emphasis in this area and maintain it through 6 months (May to Oct) at a high level, and decreasing it in Oct to allow adding on hybrid activity. The level of effort should be about 40% between now and April 30 increasing to about 80% from May 1 to Oct 30, and then decreasing to a redefined level at that time. It is recommended that a schedule^{25X1} be set for

to visit the customer facility on every
an two week period with each

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providing aid in the areas of

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25X1 laboratory application. Up to this time [] has been visiting the facility periodically pursuing the filter fabrication objectives set out at the beginning of the year (14 Jan).

25X1 [] should also start helping in the laboratory implementation, in addition to the work on operational applications of OIM described elsewhere. Expected schedule would be about 8 man days of [] personnel 25X1 at the laboratory facility per month, including [] and 25X1 []

25X1 It is expected that a full-time ^{man} contribution of customer personnel will be applied to this program.

This effort will be reviewed

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and rescheduled on June 30, 1971.